REMARKS

Overview of the Office Action

Claims 1 and 13 have been rejected under 35 U.S.C. § 112, first paragraph for failing to comply with the written description requirement.

Claims 1-6 and 11-12 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 6,242,764 to Ohba ("Ohba").

Claims 7-10 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ohba in view of U.S. Patent 5,771,110 to Hirano ("Hirano").

Status of the claims

Claim 1 has been amended.

Claims 1-13 remain pending.

Summary of the Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The specification discloses a method for depositing a material on a substrate wafer. The method includes: (a) providing the substrate wafer (1), which has a growth area (4) intended for a later material deposition; (b) applying a thermal radiation absorption layer (2), which exhibits a good absorption of thermal radiation, on a rear side (5) of the substrate wafer (1) which faces away from the growth area (4); (c) heating the substrate wafer (1) to a deposition temperature; and (d) depositing a material (3) onto the growth area (4) of the substrate wafer (1) by an

MOVPE method, wherein the thermal radiation absorption layer (2) is applied before the deposition of the material onto the growth area (4) of the substrate wafer (1); and wherein the substrate wafer (1) is heated by the thermal radiation absorption layer (2) during MOVPE (metal organic vapor phase epitaxy).

Amendments to the specification

The specification has been amended to include details of Applicants' method that can be found in the English translation of the priority German patent application 102 50 915.8-33. According to paragraph [0001] of the present application, the disclosure of priority German patent application is incorporated by reference into the U.S. application under 37 C.F.R. 1.55 and 1.57. Specifically, support for the claim amendment can be found on page 2, lines 11-14 of the English translation of the priority German patent application. In accordance with 37 C.F.R. 1.57, copies of the prior filed German application and a copy of the English translation are attached.

Amendment to claim 1

In response to the Non-Final Office Action dated March 27, 2006, Applicants have amended claim 1 to include the limitation "wherein the thermal radiation absorption layer is applied before the deposition of the material onto the growth area of the substrate wafer". In the Final Office Action dated July 24, 2006, the Examiner rejected the amended claim 1 under 35 U.S.C. §112, first paragraph, for allegedly including subject matter that was not described in the specification. In response to the Final Office Action, Applicants argued that the originally filed specification provided sufficient support for the claim 1 amendment. In the Advisory Action dated November 22, 2006, the Examiner maintained the 35 U.S.C. §112, first paragraph

rejection. In an amendment accompanying an RCE, Applicants amended claim 1 to remove the allegedly unsupported limitation.

However, as pointed out above, the priority German patent application 102 50 915.8-33 is incorporated by reference into the U.S. application, and thus there is explicit support for the claim limitation "wherein the thermal radiation absorption layer is applied before the deposition of the material onto the growth area of the substrate wafer". Therefore, independent claim 1 has been amended to again include the limitation "wherein the thermal radiation absorption layer is applied before the deposition of the material onto the growth area of the substrate wafer".

Claims 1 and 13 are patentable under 35 U.S.C. § 112, first paragraph

The Office Action indicates that claims 1 and 13 contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors, at the time the application was filed, had possession of the claimed invention.

With respect to claim 1, the Examiner states that Applicants' previous amendment introduces new subject matter that has no support in the specification. The Examiner further states that paragraphs [0005]-[0007], which were cited by the Applicants, provide no explicit support for the claim amendment that the "substrate wafer is heated by the thermal radiation absorption layer during MOVPE".

As disclosed in paragraph [0003] of Applicants' specification, "During epitaxy on SiC substrate wafers, the heating of the substrate wafer to the deposition temperature is principally effected by contact and heat convection. Since the substrate wafer usually bends during the heating process, the locations at which contact is kept with the heating source are heated to a greater extent than the locations which are no longer in contact with the heating source on

account of the curvature. This leads to a non-uniform heating of the substrate wafer. Since the deposition of some materials, in particular semiconductor materials, is extremely temperature-sensitive, temperature inhomogeneities on the growth area lead to large variations in the properties of the deposited semiconductor material."

As disclosed in paragraph [0004] of Applicants' specification, "it is possible to achieve a more uniform temperature on the growth area of the substrate wafer by heating using thermal radiation. In the case of an SiC substrate wafer, however, thermal radiation cannot be used because SiC is transparent in the entire spectral range above about 400 nm and is therefore unable to absorb radiation in this range."

As disclosed in paragraph [0005] of Applicants' specification, "In order to improve the heat input into a substrate wafer during MBE (molecular beam epitaxy), it is known to apply metal layers on the rear side of the substrate wafer, which can absorb the thermal radiation better than the substrate wafer. This method leads to a narrower temperature distribution on the substrate wafer and thus to less variation in the emission wavelength of the deposited, temperature-sensitive semiconductor material."

As disclosed in paragraph [0006] of Applicants' specification, "In MOVPE (metal organic vapour phase epitaxy), such a metal layer has not been used heretofore because an additional layer on the rear side of the substrate wafer possibly leads to contaminants in the reactive gas space. Therefore, at the present time there are no measures known for MOVPE which enable a uniform heating of the substrate wafer in particular of an SiC-based substrate wafer."

Therefore, as indicated in paragraph [0007] of Applicants' specification, it is an object of the present invention to specify a method of depositing a material on a substrate wafer using

MOVPE, where a radiation absorption layer is applied to the rear side of the substrate wafer to heat the substrate wafer during MOVPE.

Further, as disclosed in paragraph [0025] of Applicants' specification, "In Figure 1b, a thermal radiation absorption layer 2 is applied on the rear side 5 of the substrate wafer 1....This layer is absorbent for the most part of the thermal radiation and thereby effects a homogeneous heating of the substrate wafer."

In view of the above cited paragraphs, Applicants submit that the recited limitation "wherein the substrate wafer is heated by the thermal radiation absorption layer during MOVPE" is clearly supported in the originally filed specification.

With respect to claim 13, the Office Action indicates that claim 13 is not commensurate in scope with the specification because it claims a non-metallic layer, which, although supported in paragraph [0028], is deposited via methods of deposition other than MOVPE. This allegedly contradicts claim 13, which depends from claim 1, which recites a method that utilizes a MOVPE technique.

Dependent claim 13 is clearly supported by the disclosure in paragraph [0026] of Applicants' originally filed specification, which reads "Other semiconductor materials and also non-semiconducting but preferably non-metallic materials or a mixture thereof may also be used as the thermal radiation absorption layer 2."

Applicants' submit that these rejections have now been overcome.

Descriptive Summary of Ohba

Ohba discloses a GaN-based compound semiconductor light-emitting element that includes an AlN buffer layer, a GaN lattice strain moderating layer, and an n-type AlGaN contact

layer formed on the layer. Ohba discloses that an electrically conductive material is used for forming the substrate and an electrode is mounted to a back surface of the conductive substrate, with the result that the p-side electrode can be brought into contact with a heat dissipator.

Descriptive Summary of Hirano

Hirano discloses a method of fabricating a thin film transistor by setting the temperature of a heat treatment for crystallizing an active layer which is formed on a substrate at a level not deforming the substrate and activating an impurity layer in a heat treatment method different from that employed for the heat treatment, and a semiconductor device prepared by forming a heat absorption film, a semiconductor film, a gate insulating film, and a gate electrode on a substrate, the heat absorption film being provided within a region substantially corresponding to the semiconductor film.

Claims 1-6 and 11-12 are allowable over Ohba under 35 U.S.C. § 102(b)

With respect to claim 1, the Office Action states that Ohba teaches all of Applicants' recited elements.

Independent claim 1 has been amended to point out more clearly the subject matter that Applicants' regard as the invention. Applicants' amended independent claim 1 now recites a method for depositing a material (3) on a substrate wafer (1). The method includes: (a) providing the substrate wafer (1), which has a growth area (4) intended for a later material deposition; (b) applying a thermal radiation absorption layer (2), which exhibits a good absorption of thermal radiation, on a rear side (5) of the substrate wafer (1) which faces away from the growth area (4); (c) heating the substrate wafer (1) to a deposition temperature; and (d)

depositing a material (3) onto the growth area (4) of the substrate wafer (1) by an MOVPE method, wherein the thermal radiation absorption layer (2) is applied before the deposition of the material onto the growth area (4) of the substrate wafer (1); and wherein the substrate wafer (1) is heated by the thermal radiation absorption layer (2) during MOVPE (metal organic vapor phase epitaxy). Support for this claim amendment can be found in newly amended paragraph [0008] of the originally filed specification.

Ohba fails to teach or suggest a method for depositing a material (3) on a substrate wafer (1), wherein the thermal radiation absorption layer (2) is applied before the deposition of the material onto the growth area (4) of the substrate wafer (1), and wherein the substrate wafer (1) is heated by the thermal radiation absorption layer (2) during MOVPE.

Ohba teaches a GaN-based compound semiconductor light-emitting element that includes an AlN buffer layer, a GaN lattice strain moderating layer, and an n-type AlGaN contact layer formed on the layer. The GaN lattice strain moderating layer has a lattice constant larger than that of the AlN buffer layer. On the other hand, the contact layer has a lattice constant smaller than that of the AlN buffer layer. Further, the GaN lattice strain moderating layer has a thickness falling within a range of between 0.01 μm to 0.5 μm. Further, Ohba at col. 9, lines 24-28, states that "an electrically conductive material is used for forming the substrate and an electrode is mounted to a back surface of the conductive substrate, with the result that the p-side electrode can be brought into contact with a heat dissipator". Specifically, Ohba (col. 9, lines 28-32; Fig. 6) teaches that each of a SiC substrate 501 and a SiC buffer layer 503 is doped with an n-type impurity and, thus, exhibits an n-type conductivity. Also, an n-side electrode 522 is formed on the back surface of the n-type SiC substrate 501. Thus, Ohba teaches a device that has an n-side metal contact layer, and that this contact layer is applied to the rear side of the substrate. Further,

Ohba discloses a MOCVD process wherein an SiC substrate or sapphire substrate is put on a susceptor, which also acts as a heater (see col. 9, lines 51-53 of Ohba).

In contrast to Applicants' recited invention, the electrode layers 522 of Ohba are applied to the rear side of a substrate after the device structure has been grown. Ohba fails to teach that the electrode is applied before the device structure is grown. Ohba thus fails to teach that a thermal radiation absorption layer is applied before deposition of the material onto the growth area of a substrate wafer, as recited in Applicants' amended independent claim 1.

Also in contrast to Applicants' recited invention, Ohba does not teach or suggest that the SiC substrate or sapphire substrate is heated by a thermal radiation absorption layer during MOCVD. Moreover, Ohba does not teach or suggest that the n-side electrode 522 has the quality of a thermal radiation absorption layer.

As discussed in paragraph [0005] of Applicants' specification, in order to improve the heat input into a substrate wafer during MBE (molecular beam epitaxy), it is known to apply metal layers on the rear side of the substrate wafer, which can absorb the thermal radiation better than the substrate wafer.

As discussed at paragraph [0006] of Applicants' specification, a metal layer placed on the rear side of a substrate, such as the substrate of the structure disclosed in Ohba, would lead to contamination of the reactor gas in a MOCVD apparatus. Previously, such metal layers were not used in MOVPE (metal organic vapor phase epitaxy), because such an additional layer on the rear side of the substrate wafer could lead to the introduction of contaminants in the reactive gas space. Applicants have achieved exactly what could not previously be achieved, i.e., the application of a thermal radiation absorption layer on the rear side of a substrate wafer, wherein the substrate wafer is heated by the thermal radiation absorption layer during MOVPE, as recited

in Applicants' amended independent claim 1. Ohba fails to teach these limitations.

In response to Applicants' previous arguments, the Examiner states that the AlTi layer shown in Fig. 6 of Ohba is acting as a means for thermal absorption layering and therefore reads on Applicants' recited invention.

The AlTi layer disclosed by Ohba, as previously discussed, is applied to the rear side of a substrate after the device structure has been grown. Ohba fails to teach that the electrode (522) is applied before the device structure is grown. Therefore, Ohba fails to teach or suggest the limitations recited in Applicants' amended independent claim 1.

In view of the foregoing, it is respectfully submitted that Ohba does not teach or suggest the subject matter recited in Applicants' amended independent claim 1. Specifically, Ohba does not teach or suggest a method for depositing a material (3) on a substrate wafer (1), wherein the thermal radiation absorption layer (2) is applied before the deposition of the material onto the growth area (4) of the substrate wafer (1), and wherein the substrate wafer (1) is heated by the thermal radiation absorption layer (2) during MOVPE. Accordingly, independent claim 1 is patentable thereover under 35 U.S.C. §102(b).

Dependent claims

Claims 2-6 and 11-12, which depend directly or indirectly from the independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, patentably distinct over Ohba for at least those reasons provided for independent claim 1.

Claims 7-10 and 13 are patentable under 35 U.S.C. § 103(a)

With respect to claims 7-10, the Office Action states that the combination of Ohba and Hirano teaches all of Applicants' recited elements.

Ohba has been previously discussed, and does not teach or suggest the invention recited in Applicants' amended independent claim 1.

Because Ohba does not teach or suggest the subject matter recited in independent claim 1, and because Hirano does not teach or suggest the elements of claim 1 that Ohba is missing, the claimed invention is patentable over the combination of these references.

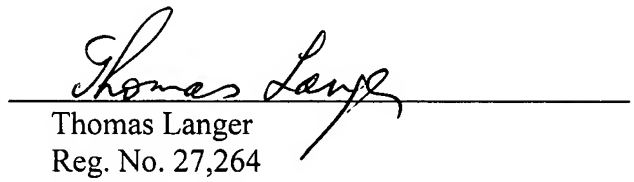
Conclusion

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of all rejections, and allowance of all pending claims in due course.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues

Respectfully submitted,

COHEN PONTANI LIEBERMAN & PAVANE LLP

By 

Thomas Langer
Reg. No. 27,264
551 Fifth Avenue, Suite 1210
New York, New York 10176
(212) 687-2770

Dated: May 29, 2007